

I. Lohberg does not disclose a braking system including an assisting device for applying an assisting drive force without applying a counteracting force.

II. Lohberg does not disclose a braking system including changing means for changing a relationship between an assisting drive force and a brake operating condition quantity, the relationship being in a normal operation of the braking system with an operation of a brake operating member.

III. Lohberg does not disclose a master cylinder characteristic control device for controlling an amount of fluid in a pressurizing chamber of a master cylinder, on the basis of a brake operating condition quantity, to thereby control a relationship between a position of the pressurizing piston relative to a cylinder housing and a fluid pressure in the pressurizing chamber.

Reasons I, II and III are discussed in more detail in the following.

I. Lohberg does not disclose a braking system including an assisting device for applying an assisting drive force without applying a counteracting force.

Claim 1 is allowable over Lohberg for at least the reason that Lohberg does not teach a braking system including an assisting device for applying an assisting drive force without applying a counteracting force.

More specifically, among other features, claim 1 requires an assisting device for applying an assisting drive force to a pressurizing piston included in a master cylinder. The assisting drive force is different than a primary drive force to be applied to the pressurizing piston on the basis of a brake operating force acting on a brake operating member of the braking system. The assisting device

applies the assisting drive force to the pressurizing piston in a first direction in which the primary drive force is applied to the pressurizing piston, without application of a force to the brake operating member in a direction opposite to a second direction in which the brake operating force acts on the brake operating member -- that is, without applying a counteracting force.

By contrast, in the structures described in Lohberg, there will always be a counteracting force, due to a moment about a midpoint of a lever. This counteracting force may be better understood in view of the following description of the structures disclosed in Lohberg.

Fig. 2 of Lohberg, relied upon in the present Office Action, shows two braking pressure generators 28, 29 which include respective master cylinders 32, 34 and which are provided with respective "control elements" 30, 31 and a single common "control element" 38. Each of two levers 43, 44 associated with the respective master cylinders 32, 34 and respective elements 30, 31 is, at one end, "hinged to" [sic] (col. 5, line 42) a lever 5' connected to a brake pedal 2. At their other ends, levers 43, 44 are respectively connected to elements 30, 31. The levers 43, 44 are further respectively connected at their midpoints to generators 28, 29.

The elements 30, 31 may generate an "auxiliary force for assisting the pedal force" (col. 5, lines 38-40). For purposes of demonstrating differences between the structure of Lohberg and the structure recited in present claim 1, this auxiliary force may be viewed as analogous (up to a point) to the assisting drive force recited in claim 1. Similarly, an operating force applied to the brake pedal 2 may be viewed as analogous to the brake operating force recited in claim 1.

As noted, the auxiliary force of Lohberg is only analogous to the recited assisting drive force up to a point -- there is a key distinction between these two forces. In contrast to the assisting drive force of claim 1, the auxiliary force of Lohberg inevitably generates a counteracting force on the brake pedal 2 -- that is, a force acting in a direction opposite to a direction in which the brake operating force acts on the brake pedal 2. This is evident since the auxiliary forces generated by elements 30, 31 are respectively applied at ends of levers

43, 44 and consequently there is a torque resulting from the auxiliary forces and acting in a direction opposite to the force corresponding to the brake operating force, due to a moment about the respective midpoints of the levers 43, 44. This counteracting force may disadvantageously increase effort of an operator of the brake pedal.

By contrast, in the braking system recited in claim 1 of the present application, there is no such counteracting force. Instead, referring to Fig. 15, assisting device 81 controls a pressure in an assisting pressure chamber 224 to apply an assisting drive force in a direction of application of a primary drive force based on a force applied to the brake operating member 10, without any counteracting force. That is, in the terms of claim 1, the assisting drive force is applied without application of a force to the brake operating member in a direction opposite to a second direction in which the brake operating force acts on the brake operating member. Because the structure of Lohberg clearly cannot meet this claim recitation, claim 1 is allowable over Lohberg.

Note is taken of the Examiner's contention in paragraph 6 of the Office Action that the applicant makes "an incorrect assumption that the pivot point in the middle (the attachment to the rod going into the master cylinder) is fixed." However, the applicant has stated no such assumption. Moreover, it is unclear what "pivot point" the Examiner is referring to. Assuming that the Examiner is referring to either a point where rod 26 attaches to lever 6 (Fig. 1) or points where unnumbered rods of boosters 35 and 36 respectively attach to levers 43 and 44 (Fig. 2), the applicant's argument does not depend on whether or not the points are fixed. The mechanisms attached to these points opposite the auxiliary forces (booster 8, cylinder 7; boosters 33, 35, cylinders 32, 34) are not resistless -- if they were no braking pressure would be generated. A resisting force in a direction opposite to the auxiliary forces generated by any of elements 3, 30 or 31 will be felt at these points whether they are fixed or not, resulting in the counteracting forces discussed above.

Further comments in paragraph 6 of the Office Action are not clearly understood. Specifically, it is unclear how the Examiner's contention that "the force applied by the assisting device is counteracted by the reaction force of the master cylinder (from the pressure of the hydraulic fluid) to produce a net force change of zero at the brake pedal" and "[t]he assisting device of Lohberg will always decrease the amount of force needed to actuate the master cylinder a certain amount" has a bearing on what the applicant claims and argues.

II. Lohberg does not disclose a braking system including changing means for changing a relationship between an assisting drive force and a brake operating condition quantity, the relationship being in a normal operation of the braking system with an operation of a brake operating member.

Claim 1 is further allowable over Lohberg for at least the reason that Lohberg does not teach a braking system including changing means for changing a relationship between an assisting drive force and a brake operating condition quantity, the relationship being in a normal operation of the braking system with an operation of a brake operating member, as required by claim 1. This may be better understood in an analysis that refers to Fig. 1; the analysis thereof is then readily applied to Fig. 2 as well.

Lohberg discloses an element 3 (illustrated in Fig. 1) that, like elements 30 and 31 discussed earlier, generates an auxiliary force that may, for purposes of illustrating differences between the structure of Lohberg and the structure recited in present claim 1, be viewed as analogous (up to a point -- one key distinction has been noted above and others are noted further on) to the assisting drive force recited in claim 1. Similarly, an operating force applied to the brake pedal 2 may be viewed as analogous to the brake operating force recited in claim 1.

In the structure of Lohberg, it is not possible during normal operation to change the relationship between the auxiliary force and an operation force applied to the brake pedal. As disclosed in Lohberg, during normal operation driving shaft 25 of element 3 is displaced in parallel with push rod 5 connected to

brake pedal 2 so that lever 6 is displaced axially without tilting (col. 3, lines 47-60). This means that during normal operation a force applied to the brake pedal 2 of Lohberg and an auxiliary force applied by element 3 are the same and do not change with respect to each other.

More specifically, Lohberg describes a brake system including an element 3 that provides an auxiliary force that, in conjunction with a brake operating force, causes a lever 6 to be displaced without tilting during a normal operation of the brake system. In the paragraph bridging cols. 3 and 4, Lohberg describes how element 3 is operated according to an output signal of travel measuring device 19, which detects a travel of push rod 5. Push rod 5 is connected to a brake pedal 2 and is displaced by actuation of the brake pedal in normal braking operations (col. 3, lines 46-48). Push rod 5 and a driving shaft 25 of control element 3 are connected to respective ends of a lever 6. Element 3 is operated to displace driving shaft 25 (corresponding to the auxiliary force) by the same amount as the detected travel of the push rod 5 (corresponding to the brake operating force), so that lever 6 is displaced without tilting, to operate booster 8 and master cylinder 1 (col. 3, lines 56-67).

In order to maintain the non-tilting orientation of lever 6, because the two arms 6', 6" of lever 6 have the same length (col. 3, lines 38-41), the auxiliary force generated by control element 3 must be half of a total input force applied to the booster 8 (the total input force applied to a master cylinder piston) during a normal operation of the braking system. The other half of the total input force is generated by operation of the brake pedal 2, and is therefore equal to the brake operating force. Thus, it is clear that in the structure described in Lohberg, it is not possible to change a relationship between the auxiliary drive force and the operating force of the brake pedal under normal operating conditions.

Fig. 2 of Lohberg shows what is essentially a doubling of the structure shown in Fig. 1, or more specifically (at least in terms of the visual depiction), the structure of Fig. 1 combined with an inversion of a portion thereof. Therefore, with respect to the foregoing analysis of Fig. 1, the arrangement of Fig. 2 of

Lohberg operates in the same way as the structure of Fig. 1 of Lohberg. Consequently, Lohberg cannot meet the recitations of claim 1.

A. Independent claims 42 and 43 also recite "changing means" as in claim 1.

Both independent claims 42 and 43 also recite "changing means for changing a relationship between said assisting drive force and said brake operating condition quantity, said relationship being in a normal operation of the braking system with an operation of said brake operating member" as discussed above in connection with claim 1. Therefore, claims 42 and 43 are likewise allowable over Lohberg for at least that reason.

B. Independent claims 42 and 43 are further allowable in view of other recitations therein.

Independent claim 42 is further allowable over Lohberg in view of other recitations therein. Independent claim 42 recites, among other features, a sensing device for detecting a brake operating condition quantity indicative of an operating condition of a brake operating member. Claim 42 further recites an assisting device for applying to a pressurizing piston an assisting drive force which is different than a primary drive force to be applied to the pressurizing piston on the basis of a brake operating force acting on the brake operating member, the assisting device including only one actuator operable to generate the assisting drive force. Claim 42 further recites that the assisting device comprises an assisting drive force control device electrically operable to control the only one actuator for controlling the assisting drive force on the basis of the brake operating condition quantity detected by the sensing device. The recited features are absent from Lohberg. Accordingly, claim 42 is allowable over Lohberg.

Independent claim 43 is also further allowable over Lohberg in view of other recitations therein. Independent claim 43 requires an assisting device for applying to a pressurizing piston an assisting drive force which is different than a primary drive force to be applied to the pressurizing piston on the basis of a brake operating force acting on a brake operating member, such that the assisting drive force is applied to the pressurizing piston in a first direction in which the primary drive force is applied to the pressurizing piston, the assisting device not including an actuator operable to generate a force to be applied to the brake operating member in a direction opposite to a second direction in which the brake operation force acts on the brake operating member. Clearly, the structure of Lohberg includes an actuator (element 4 or 38) operable to generate such a force. Therefore, claim 43 is allowable over Lohberg.

III. Lohberg does not disclose a master cylinder characteristic control device for controlling an amount of fluid in a pressurizing chamber of a master cylinder, on the basis of a brake operating condition quantity, to thereby control a relationship between a position of the pressurizing piston relative to a cylinder housing and a fluid pressure in the pressurizing chamber.

Discussion now turns to independent claim 35. Claim 35 recites, among other features, a master cylinder characteristic control device for controlling an amount of fluid in a pressurizing chamber of a master cylinder, on the basis of a brake operating condition quantity, to thereby control a relationship between a position of the pressurizing piston relative to a cylinder housing and a fluid pressure in the pressurizing chamber. Note is taken of the Examiner's statement that "... control [is] provided by ECU 22" (paragraph 3) and that "Lohberg controls this relationship by controlling the amount of fluid as does all booster and assisting devices" (paragraph 6). However, the applicant respectfully takes a different position. Lohberg is completely silent as to the ECU 22 performing any of the functions recited in claim 35. While in Fig. 1 Lohberg shows a booster 8

connected to a master cylinder 7, there is no discussion, or any indication in Fig. 1, of cooperation between the ECU 22 and the booster 8 or master cylinder 7 to provide the control alleged to be provided by the ECU 22. Similar observations are also true of Figs. 2 and 3. The Examiner's statement thus appears to be based on personal knowledge of the Examiner rather than explicit disclosure in Lohberg; however, the applicant respectfully requests documentary proof that the claimed arrangement is known in the prior art. Absent such proof, the applicant respectfully submits that claim 35 is allowable over Lohberg.

Claims 3, 21, 36-37 and 41 depend on claim 1, and consequently are allowable for at least the reasons discussed in connection with claim 1. (It is noted that, although claims 3 and 21 are indicated as being rejected in the "Summary" portion of the Office Action, no explicit basis is provided in the Office Action for rejection of claims 3 and 21.) Claim 39 depends on claim 35, and consequently is allowable for at least the reasons discussed in connection with claim 35. Accordingly, in view of the foregoing discussion, withdrawal of the rejection of claims 1, 3, 21, 35-37, 39 and 41-43 is respectfully requested.

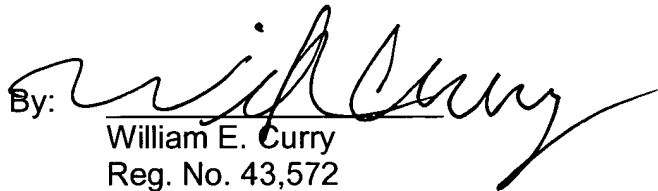
Claims 38 and 40 were rejected under 35 USC 103(a) as being unpatentable over Lohberg in view of Schramm et al. (U.S. 5,954,407). However, claims 38 and 40 are allowable over Lohberg for at least the reasons that they respectively incorporate the limitations of claims 1 and 35. Schramm et al. does not remedy the deficiencies in Lohberg with respect to claims 1 and 35, and consequently claims 38 and 40 are further allowable over the combination of Lohberg and Schramm et al. Withdrawal of the rejection of claims 38 and 40 is therefore respectfully requested.

In light of the above discussion, Applicant respectfully submits that the present application is in all aspects in allowable condition, and earnestly solicits favorable reconsideration and early issuance of a Notice of Allowance.

The Examiner is invited to contact the undersigned at (202) 220-4323 to discuss any matter concerning this application. The Office is authorized to charge any fees under 37 C.F.R. 1.16 or 1.17 related to this communication to Deposit Account No. 11-0600.

Respectfully submitted,

Dated: JAN. 7, 2004

By: 
William E. Curry
Reg. No. 43,572

KENYON & KENYON
1500 K Street, N.W., Suite 700
Washington, D.C. 20005
Tel: (202) 220-4200
Fax: (202) 220-4201